



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/804,810	03/19/2004	Jonathan J. Wierer JR.	LUM-03-05-01	8900
32566	7590	09/23/2005	EXAMINER	
PATENT LAW GROUP LLP 2635 NORTH FIRST STREET SUITE 223 SAN JOSE, CA 95134			HO, TU TU V	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 09/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/804,810

Applicant(s)

WIERER ET AL.

Examiner

Tu-Tu Ho

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 August 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) 29-31 and 34-37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28, 32 and 33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statements (IDS) submitted on 03/19/2004, 01/31/2005, and 07/29/2005 have been considered by the examiner. The information disclosure statement (IDS) submitted on 09/15/2005 has not been considered by the examiner because it has not materialized, i.e., scanned, in the electronic record. It will be considered when the materials materialize.

Election/ Restriction

2. Applicant's election without traverse of Group I Invention, claims 1-33, in the reply filed on 07/05/2005 is acknowledged. Applicant's election without traverse of Species II, claims 1-28, 32, and 33, in the reply filed on 08/03/2005 is acknowledged

3. Claims 34-37 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 07/05/2005 as noted above. Claims 29-31 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 08/03/2005 as noted above.

Claim Rejections - 35 USC § 102

Art Unit: 2818

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. **Claims 1-2, 4, 8, 13-14, 21, 27, and 32-33** are rejected under 35 U.S.C. 102(e) as being anticipated by Lin et al. U.S. Patent Application Publication 20050035354 (hereinafter the '354 reference).

The '354 reference discloses in Figs. 10-11 and respective portions of the specification a light emitting device as claimed.

Referring to **claim 1**, the '354 reference discloses a light emitting device comprising:

a (group-) III-nitride semiconductor structure including an active region (515, Figs. 10-11, paragraph [0037]) disposed between an n-type and a p-type region (513 and 516); and

a photonic crystal structure (generally indicated at holes 533, paragraph [0037]) formed in at least a portion of the n-type region (516, paragraphs [0037] and [0040], and note that the teaching is not restricted to a specific polarity, therefore region 516 can be n-type or p-type as is known in the art); and

a reflector ("DBR" 512, for "Distributed Bragg Reflector", paragraphs [0005] and [0037]) disposed on at least a portion of a surface of the p-type region (513) opposite the active region.

Referring to **claim 2**, the reference further discloses that the photonic crystal structure comprises a periodic variation (paragraph [0037]) in a thickness of the n-type region (516).

Referring to **claim 4**, the reference further discloses that the photonic crystal structure (generally indicated at holes 533) comprises a planar lattice of holes (533).

Referring to **claim 8**, the reference further discloses that the planar lattice is triangular or other pattern, satisfying the claimed Markush group of a triangular lattice, a square lattice, a hexagonal lattice, and a honeycomb lattice.

Referring to **claims 13 and 14**, since the reference does not teach intentionally filling the holes (531) with a material or removing air from the holes, the holes (531) are filled with air, a natural dielectric material, which has a dielectric constant of 1, which meets the claimed limitation of a dielectric constant of about 1 and about 16.

Referring to **claim 21**, the reference further discloses that a portion of the reflector underlies the photonic crystal structure.

Referring to **claim 27**, the reference further discloses that the photonic crystal structure is formed in a first portion of the n-type region (516), the device further comprising a contact (520, Fig. 10) formed on a second portion of the n-type region, the second portion being substantially free of the photonic crystal structure.

Referring to **claims 32 and 33**, the reference further discloses that the photonic crystal structure extends into the active region and into the p-type region (paragraph [0037], last three sentences).

5. **Claims 1-2, 4, 8, 13-14, 17-21, and 26-27** are rejected under 35 U.S.C. 102(e) as being anticipated by Erchak et al. U.S. Patent 6,831,302 (hereinafter the '302 reference).

The '302 reference discloses in Fig. 1 and respective portions of the specification a light emitting device as claimed.

Referring to **claim 1**, the '302 reference discloses a light emitting device comprising:
a (group-) III-nitride semiconductor structure including an active region ("light generation region" 130, column 9, line 10-25) disposed between an n-type and a p-type region (134 and 128); and
a photonic crystal structure (generally indicated at holes 150) formed in at least a portion of the n-type region (134); and
a reflector (126, column 9, lines 60-62) disposed on at least a portion of a surface of the p-type region (128) opposite the active region (130).

Referring to **claim 2**, the reference further discloses that the photonic crystal structure comprises a periodic variation (column 10, lines 10-15) in a thickness of the n-type region (134).

Referring to **claim 4**, the reference further discloses that the photonic crystal structure (generally indicated at holes 150) comprises a planar lattice of holes (150).

Referring to **claim 8**, the reference further discloses that the planar lattice is triangular (column 10, lines 10-15), satisfying the claimed Markush group of a triangular lattice, a square lattice, a hexagonal lattice, and a honeycomb lattice.

Referring to **claims 13 and 14**, since the reference does not teach intentionally filling the holes (150) with a material or removing air from the holes, the holes (150) are filled with air, a natural dielectric material, which has a dielectric constant of 1, which meets the claimed limitation of a dielectric constant of about 1 and about 16.

Referring to **claims 17-20**, the reference teaches that the total thickness of the group-III nitride semiconductor layers including the n-type region (134, having a thickness of 320 nm, column 9, lines 10-20), the active region (130, having a thickness of 120 nm, column 9, lines 10-20), and the p-type region (128, having a thickness of 40 nm, column 9, lines 10-20) is about 480 nm, which is about the thickness as claimed of less than 0.5 μm (500 nm) or of less than 1 μm (1000 nm).

Referring to **claim 21**, the reference further discloses that a portion of the reflector underlies the photonic crystal structure.

Referring to **claim 26**, the reference further discloses that the reflector (126) comprises silver (column 9, lines 14-17).

Referring to **claim 27**, the reference further discloses that the photonic crystal structure is formed in a first portion of the n-type region (134), the device further comprising a contact (136) formed on a second portion of the n-type region, the second portion being substantially free of the photonic crystal structure.

6. **Claims 1-2, 4, 13-14, 21-22, 27, and 32-33** are rejected under 35 U.S.C. 102(e) as being anticipated by Lee et al. U.S. Patent Application Publication 20050173717 (hereinafter the '717 reference).

The '717 reference discloses in Figs. 1-7, particularly Fig. 2, and respective portions of the specification a light emitting device as claimed.

Referring to **claim 1**, the '717 reference discloses a light emitting device comprising:

Art Unit: 2818

a (group-) III-nitride semiconductor structure (paragraph [0016]) including an active region (121/122/123, paragraph [0017]) disposed between an n-type and a p-type region (“cladding regions” 124 and 131/132, paragraphs [0017] and [0020]); and

a photonic crystal structure (generally indicated at holes 201, paragraph [0020], particularly the section bridging pages 2 and 3) formed in at least a portion of the n-type region (124, paragraph [0019], and note that the teaching is not restricted to a specific polarity, therefore region 124 can be n-type or p-type as is known in the art); and

a reflector (“DBR” 133, for “Distributed Bragg Reflector”, paragraph [0019]) disposed on at least a portion of a surface of the p-type region (131/132) opposite the active region.

Referring to **claim 2**, the reference further discloses that the photonic crystal structure comprises a periodic variation (paragraph [0020]) in a thickness of the n-type region (124).

Referring to **claim 4**, the reference further discloses that the photonic crystal structure (generally indicated at holes 201) comprises a planar lattice of holes (201).

Referring to **claims 13 and 14**, since the reference does not teach intentionally filling the holes (201) with a material or removing air from the holes, the holes (201) are filled with air, a natural dielectric material, which has a dielectric constant of 1, which meets the claimed limitation of a dielectric constant of about 1 and about 16.

Referring to **claim 21**, the reference further discloses that a portion of the reflector underlies the photonic crystal structure.

Referring to **claim 22**, the reference further discloses a host substrate (paragraph [0021]).

Referring to **claim 27**, the reference further discloses that the photonic crystal structure is formed in a first portion of the n-type region (124), the device further comprising a contact (127)

Art Unit: 2818

formed on a second portion of the n-type region, the second portion being substantially free of the photonic crystal structure.

Referring to **claims 32 and 33**, the reference further discloses that the photonic crystal structure (generally indicated at 203) extends into the active region and into the p-type region (paragraph [0020]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. **Claims 3, 5-7, 9-12, and 15-20** are rejected under 35 U.S.C. §103(a) as being unpatentable over Lin et al. U.S. Patent Application Publication 20050035354 (hereinafter the '354 reference).

Referring to **claims 3, 6, and 10-12**, although the reference does not teach a range of ratios of the period of the periodic structure and the wavelength of light emitted by the active region as claimed, the reference discloses that the period and the diameter of the holes 533 and the periodic structure of the photonic crystal structure comprising holes 533 is related to emitting visible lights, or in other words, a function of the wavelength of light emitted by the light emitting device (paragraph [0037]), and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Art Unit: 2818

Referring to **claims 5 and 6**, although the reference does not teach a range of the depths for the holes as claimed, as detailed above, the reference disclose that the depth of the holes can be changed, and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claim 7**, although the reference does not disclose a range of greater than a value of the radiation (light) emitting or exiting the device as claimed, the reference teaches improving light extraction efficiency and increasing light output (paragraph [0001]), and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claim 9**, as detailed above for claim 8, the reference discloses that the planar lattice is triangular or other pattern, satisfying the claimed Markush group of a triangular lattice, a square lattice, a hexagonal lattice, and a honeycomb lattice; however, the reference fails to teach that the planar lattice includes more than one lattice type as recited in claim 9.

Nevertheless, as the reference does not teach that the planar lattice must be a single planar lattice type, such a change to include more than one lattice type would have been obvious to one of ordinary skill in the art at the time the invention was made.

Referring to **claim 15**, although the reference does not disclose a range of a distance between the reflector and the photonic structure as claimed, the reference teaches that the depth of the holes can be changed (paragraph [0037]), and because the holes, which define the photonic structure, do not reach the reflector layer 512, the reference in effect teaches that a

Art Unit: 2818

distance between the reflector and the photonic structure can be changed, and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claim 16**, although the reference does not teach a distance between a center of the active region (515) and the photonic crystal region is less than a distance as claimed, the reference teaches that the depth of the holes can be changed (paragraph [0037]), and because the holes, which define the photonic structure, do not reach the active region 515, the reference in effect teaches that a distance between the active region and the photonic structure can be changed, and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claims 17-20**, as the reference does not specifically limit the thickness of the combined layers, it would have been obvious to one of ordinary skill in the art at the time the invention was made to change the various thicknesses because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

8. **Claims 3, 5-7, 9-12, and 15-16** are rejected under 35 U.S.C. §103(a) as being unpatentable over Erchak et al. U.S. Patent 6,831,302 (hereinafter the '302 reference).

Referring to **claims 3, 6, and 10-12**, although the reference does not teach a range of ratios of the period of the periodic structure and the wavelength of light emitted by the active region as claimed, the reference discloses that the period and the diameter of the holes 150 and

Art Unit: 2818

the periodic structure of the photonic crystal structure comprising holes 150 can change (column 10, lines 14-16), and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claims 5 and 6**, although the reference does not teach a range of the depths for the holes as claimed, as detailed above, the reference disclose that the depth of the holes can be changed (column 10, lines 10-16), and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claim 7**, although the reference does not disclose a range of greater than a value of the radiation (light) emitting or exiting the device as claimed, the reference teaches improving light extraction efficiency and increasing light output (column 10, lines 25-30), and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claim 9**, as detailed above for claim 8, the reference discloses that the planar lattice is triangular, satisfying the claimed Markush group of a triangular lattice, a square lattice, a hexagonal lattice, and a honeycomb lattice; however, the reference fails to teach that the planar lattice includes more than one lattice type as recited in claim 9. Nevertheless, as the reference does not teach that the planar lattice must be a single planar lattice type, such a change to include more than one lattice type would have been obvious to one of ordinary skill in the art at the time the invention was made.

Referring to **claim 15**, although the reference does not disclose a range of a distance between the reflector and the photonic structure as claimed, the reference teaches that the depth of the holes can be changed (column 10, lines 14-16), and because the holes, which define the photonic structure, do not reach the reflector layer 126, the reference in effect teaches that a distance between the reflector and the photonic structure can be changed, and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claim 16**, although the reference does not teach a distance between a center of the active region (130) and the photonic crystal region is less than a distance as claimed, the reference teaches that the depth of the holes can be changed (column 10, lines 14-16), and because the holes, which define the photonic structure, do not reach the active region 130, the reference in effect teaches that a distance between the active region and the photonic structure can be changed, and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

9. **Claims 3, 5-7, 10-12, 15-20, and 23-25** are rejected under 35 U.S.C. §103(a) as being unpatentable over Lee et al. U.S. Patent Application Publication 20050173717 (hereinafter the '717 reference).

Referring to **claims 3, 6, and 10-12**, although the reference does not teach a range of ratios of the period of the periodic structure and the wavelength of light emitted by the active region as claimed, the reference discloses that the period and the diameter of the holes 201 and

Art Unit: 2818

the periodic structure of the photonic crystal structure comprising holes 201 is related to emitting visible lights, or in other words, a function of the wavelength of light emitted by the light emitting device (paragraph [0020]), and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claims 5 and 6**, although the reference does not teach a range of the depths for the holes as claimed, as detailed above, the reference disclose that the depth of the holes can be changed as detailed above, and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claim 7**, although the reference does not disclose a range of greater than a value of the radiation (light) emitting or exiting the device as claimed, the reference teaches improving light extraction efficiency and increasing light output (paragraph [0020]), and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claim 15**, although the reference does not disclose a range of a distance between the reflector and the photonic structure as claimed, the reference teaches that the depth of the holes can be changed (paragraph [0020]), and because the holes, which define the photonic structure, do not reach the reflector layer 133, the reference in effect teaches that a distance between the reflector and the photonic structure can be changed, and because it has been

Art Unit: 2818

accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claim 16**, although the reference does not teach a distance between a center of the active region (121/122/123) and the photonic crystal region is less than a distance as claimed, the reference teaches that the depth of the holes can be changed (paragraph [0020]), and because the holes (201), which define the photonic structure, do not reach the active region 121/122/123, the reference in effect teaches that a distance between the active region and the photonic structure can be changed, and because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claims 17-20**, as the reference does not specifically limit the thickness of the combined layers, it would have been obvious to one of ordinary skill in the art at the time the invention was made to change the various thicknesses because it has been accepted that manipulation of sizes, shapes, and efficiency is routine skill inherently possessed by a person or ordinary skill in the art, therefore such manipulation would have been obvious.

Referring to **claims 23-25**, as noted above, the reference further discloses a host substrate. Although the reference fails to provide a material for the host substrate, and also fails to provide a material for an inherent metal bonding layer to bond the original substrate and the host substrate as claimed, selecting suitable and available materials as claimed for the host substrate and the bonding layer is within a skill of a person of ordinary skill in the art therefore such selecting would have been obvious at the time the invention was made.

Art Unit: 2818

10. **Claims 1 and 26-28** are rejected under 35 U.S.C. §103(a) as being unpatentable over Otsuka et al. U.S. Patent Application Publication 20040135155 (hereinafter the '155 reference) in view of Erchak et al. U.S. Patent 6,831,302 (hereinafter the '302 reference).

The '155 reference discloses in 18A and respective portions of the specification a light emitting device substantially as claimed.

In particular, the reference discloses a light emitting device as claimed but fails to teach a reflector and fails to teach that the region that photonic structure 2/9 (Figs. 2-4 and 18A) is formed in is an n-type. Specifically, the reference discloses a light emitting device comprising:

a (group-) III-nitride semiconductor structure including an active region (4, Figs. 3-4 and 18A, paragraph [0057]) disposed between an n-type and a p-type region (3 and 5); and

a photonic crystal structure (generally indicated at 2/9, Figs. 2-4 and 18A, paragraph [0057]) formed in at least a portion of the p-type region (5).

As noted, the upper doped region (5) of the reference is a p-type as compared to the n-type as claimed. However, one of ordinary skill in the art recognizes that polarity of the upper doped region can be changed, as detailed above, so as to have two complementary doped regions (3 and 5) sandwiching the active region (4), therefore such changing of the polarity of the doped regions would have been obvious to one of ordinary skill in the art.

As for the limitation "a reflector disposed on at least a portion of a surface of the p-type region opposite the active region", the '302 reference, in also disclosing a light emitting device including a photonic crystal structure as detailed above, teaches that a light emitting device including a photonic crystal structure having a reflector (126, Fig. 1) disposed on at least a portion of a surface of the p-type region (128) opposite the active region (130) helps with

Art Unit: 2818

thermal dissipation generated from the device (column 9, lines 53-57). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the '155 reference's light emitting device such that it includes a reflector such as the silver reflector 126 taught by Erchak disposed on at least a portion of a surface of the p-type region (3) opposite the active region (4). One would have been motivated to make such a change in view of the teachings in Erchak that such a change results in better heat dissipation.

Referring to **claim 27**, the teachings further disclose that the photonic crystal structure (2/9, Figs. 2-4 and 18A, the '155 reference) is formed in a first portion of the n-type region (5), the device further comprising a contact (6, Fig. 18A) formed on a second portion of the n-type region, the second portion being substantially free of the photonic crystal structure.

Referring to **claim 28**, the teachings further disclose that the contact (6) surrounds the photonic structure (2/9, Figs. 2-4 and 18A).

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2818

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tu-Tu Ho
September 19, 2005